Mixture of vinylcyclohexane-based polymer/copolymer and stabiliser system

The present invention relates to a mixture containing vinylcyclohexane (VCH)-based polymer/copolymer and a stabiliser system, containing lactone, sterically hindered phenol and phosphite component, and to a process for the preparation of said mixture and to the use of the mixture for the manufacture of moulded articles.

In comparison with polycarbonate currently used for the manufacture of optical data stores, homopolymers with sufficient mechanical properties of the vinylcyclohexane-based polymer exhibit a higher viscosity at the same temperature in a wide range of low shear rates.

The lowest possible viscosity is of considerable importance for sufficiently good pit and groove reproduction in injection moulding.

For high densities of data storage of >5 Gbytes, particularly >10 Gbytes, accurate reproduction of the smaller and more closely packed pits and the grooves that are possible nowadays is essential. The optical storage media described in EP-A 317 263 and US-A 4 911 966 are not satisfactory for this use.

In order to obtain the largest possible processing window, high processing temperatures generally above 300°C are required for the homopolymer without a significant decrease in molecular weight occurring.

Generally speaking, a decrease in molecular weight leads to a deterioration in the mechanical properties of polymers. A sufficient level of mechanical properties is, however, necessary for the reliable manufacture of optical discs in injection moulding and for the subsequent manipulation thereof.

In everyday use the material must also be resistant to flexure and fracture.

During machine downtimes in processing it is important to ensure that the material does not suffer a drastic loss of molecular weight during this period.

The phenol and phosphorus stabilisers described in JP 01-294 753, JP 5-242 522 are suitable in high concentrations for limiting the decrease in molecular weight but lead to a considerable decrease in molecular weight at processing temperatures of only about 300°C.

JP 61-138648 describes optical data carriers which are manufactured from, i.a. polymethylmethacrylate, polycarbonate and polystyrene, the polymers containing 2-benzofuranones as stabiliser.

The object now is to stabilise VCH-based polymers/copolymers in such a way that processing can take place without a significant decrease in molecular weight, even at high temperatures.

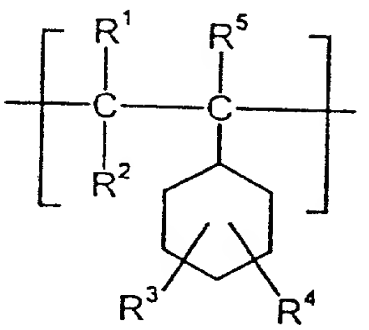
The mixtures according to the invention do not exhibit a significant decrease in the molecular weight of the polymer, even at elevated temperatures.

Surprisingly, it was found that a stabiliser system containing lactone, sterically hindered phenol, and a phosphite component together with vinylcyclohexane-based polymers markedly improves the thermostabilisation for injection-moulded optical data carriers at processing temperatures of >300°C, preferably >320°C, particularly preferably >330°C and that no significant decrease in molecular weight occurs. Depending on the polymer, degradation processes start to a large extent at temperatures between 350 and 380°C. Conventional injection moulding machines permit processing up to about 400°C.

The invention relates to a mixture containing A) vinylcyclohexane-based polymer and B) stabiliser system containing lactone, sterically hindered phenol and a phosphite compound.

Component A

The preferred vinylcyclohexane-based polymer comprises a recurring structural unit of the formula (I)



(I)

wherein

R^1 and R^2, independently of each other, represent hydrogen or C_1-C_6-alkyl, preferably C_1-C_4-alkyl, and

R^3 and R^4, independently of each other, represent hydrogen or for C_1-C_6-alkyl, preferably C_1-C_4-alkyl, particularly methyl and/or ethyl, or R^3 and R^4 jointly represent alkylene, preferably C_3 or C_4-alkylene, partially condensed 5 or 6-membered cycloaliphatic ring,

R^5 represents hydrogen or C_1-C_6-alkyl, preferably C_1-C_4-alkyl,

R^1, R^2 and R^5, independently of each another, represent in particular hydrogen or methyl.

The bonding may, apart from the stereoregular head-to-tail bonds, have a small proportion of head-to-head bonds.